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ABSTRACT

The problem-solving models described in this paper were selected because they offer nontechnological alternatives to solving school district problems, because they solicit and respect the opinions of involved workers and clients, and because each model has several variant forms that can be applied to many different kinds of problems. The three techniques described are force field analysis, which enables administrators to visualize and analyze the elements of a problem, the nominal group technique, which provides a means of polling constituent preferences, and the Delphi forecasting method, which makes the creation of consensus possible. Five examples of the application of the Delphi method are presented. (Author)

PROBLEM-SOLVING TECHNIQUES for Administrators

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FOREWORD

Both the Association of California School Administrators and the ERIC Clearinghouse on Educational Management are pleased to cooperate in producing the *School Management Digest*, a series of reports designed to offer educational leaders essential information on a wide range of critical concerns in education.

At a time when decisions in education must be made on the basis of increasingly complex information, the *Digest* provides school administrators with concise, readable analyses of the most important trends in schools today, as well as points up the practical implications of major research findings.

By special cooperative arrangement, the series draws on the extensive research facilities and expertise of the ERIC Clearinghouse on Educational Management. The titles in the series were planned and developed cooperatively by both organizations. Utilizing the resources of the ERIC network, the Clearinghouse is responsible for researching the topics and preparing the copy for publication by ACSA.

The author of this report, Norman Hale, was commissioned by the Clearinghouse as a research analyst and writer.

Bert C. Corona
President
ACSA

Philip K. Piele
Director
ERIC/CEM

INTRODUCTION

> "Well Smith, we've weighted the regressive variable which gives us the correct initial figures. Then we matched the coefficients. You understand all this of course. . . ?"

What can Smith do? He doesn't completely understand the computer printouts in front of him at a district cabinet meeting. Should he press to have a point explained or should he pass? If Smith is like the rest of us who often feel vaguely uncomfortable in the presence of columns of printed figures, he will probably pass. He will assume that *someone else* understands even if *he* does not. He allows his decision-making responsibility in this case to pass into the hands of others. He has decided not to decide.

How often is the above scene repeated? It is difficult to say, but certainly the situation is typical of a problem many school district personnel face. The information explosion, technological advances, and the sheer complexity of the school district and its services have combined to create complicated management systems. Tools like PERT (Program Evaluation and Review Technique) and PPBS (Program, Planning, Budgeting Systems) are only two examples of districtwide technological systems that evolved in the sixties. Other computerized methodologies can be used for projecting enrollments, scheduling the use of facilities, writing student schedules, and computing the costs of contracts; these are now commonplace in large school districts. No wonder people like Smith occasionally get lost in the machinery.

One effect of such systems has been to require that educational planners and decision-makers possess much greater knowledge and expertise than traditional management methods required. As Sanders notes, this "specialized knowledge and skill . . . is not possessed by many of the administrators and leaders who are truly responsible for policies and planning." Consequently, more decisions are left to the "educational technologist," who has acquired a greater role in

decision-making. As more problems come to be defined in technological terms, people like Smith who are not information specialists may be edged out of the policy processes. Either decisions will be increasingly left to the technologists or, worse, problems may simply be ignored.

While many of the problems of the school district are amenable to technological solutions, many are not. Questions of creating new programs, cancelling old ones, changing the curriculum, implementing regulations, providing community services, and locating new facilities are nonrecurring situations that require one-of-a-kind programs or decisions. They require a problem-solving flexibility that technological systems do not provide.

Where does the administrator turn when he or she needs to make decisions in these areas?

Unfortunately, much of the literature on problem-solving and decision-making is either diffuse and mathematical or too abstract for practical use. The theories are not often translated into easily understandable and applicable formulas. And nontechnological systems are especially difficult to formalize.

As an attempt to bridge the gap between a pure theory of decision-making and a theory of decision-making as an intuitive, unstructured process, we offer three nontechnological models from current educational literature. The models have been chosen for specific reasons. First, they present current alternatives to technological systems. They are inexpensive: they require no equipment more sophisticated than a hand calculator. Second, each model has several variant forms and can be applied to many different kinds of problems. Third, each has been chosen because it reflects a belief that consultation and group effort are preferable to individuals acting unilaterally.

Most important of all, each model has a specific strength. The value of force-field analysis is its ability to visualize and analyze the elements of a problem. The nominal group technique is a means of polling constituent or client preferences concerning both problems and solutions. The strength of the Delphi forecasting model is its ability to create consensus.

These models should aid Smith and any others who are faced with the problem of evaluating a new program or an old one, working with a community group, or deliberating on new policy. Used imaginatively, these models provide attractive, simple alternatives to more complex procedures. Their use will also encourage participation by more people in all areas of district decision-making.

UNDERSTANDING A SITUATION: FORCE-FIELD ANALYSIS

Force-field analysis is an especially useful technique in the early stages of problem-solving. It provides a graphic means for either one person working alone or many people working together to dissect a problem into its major parts (forces). According to force-field theory, every situation is in a state of "quasi-stationary equilibrium" as the result of a "complex field of forces" that work in "varying directions, at differing strengths. The existing situation, or status quo, is the result of the combination of these forces."

Sanders illustrates the theory pictorially in figure 1. Driving forces are defined as "those which tend to change the existing level or tend to help reach the desired level." Restraining forces are "those which tend to resist change or preserve the status quo."

An alternative illustration of the model is offered by Gaskell in figure 2. In this schema, the vertical line represents the status quo or the "equilibrium" of forces in the situation.

Force-field's view of any situation as a conglomeration of poised forces makes itself especially useful in the analysis of problems. Before making any decision on a course of action, decision-makers must be able to enumerate the various forces, both driving and restraining. Sanders notes that this rigorous analysis reveals that problems are composed of "complex fields of forces and myriad influences rather than single or isolated factors." It helps the administrator to recognize that a single hasty action as the result of a premature decision may have no effect on the complex of forces. It may even have an undesirable effect.

The following hypothetical example, which appears in Gaskell, is only one of many applications of the technique. In this situation, a teacher feels a lack of communication in the classroom. The teacher has a goal he defines as the "Open and Active Criticism of Ideas between Us." In an analysis of the

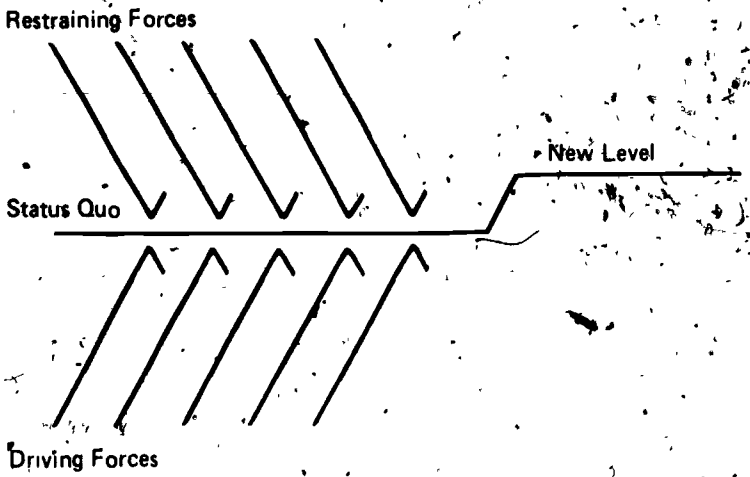

FIGURE 1

Source. Sanders

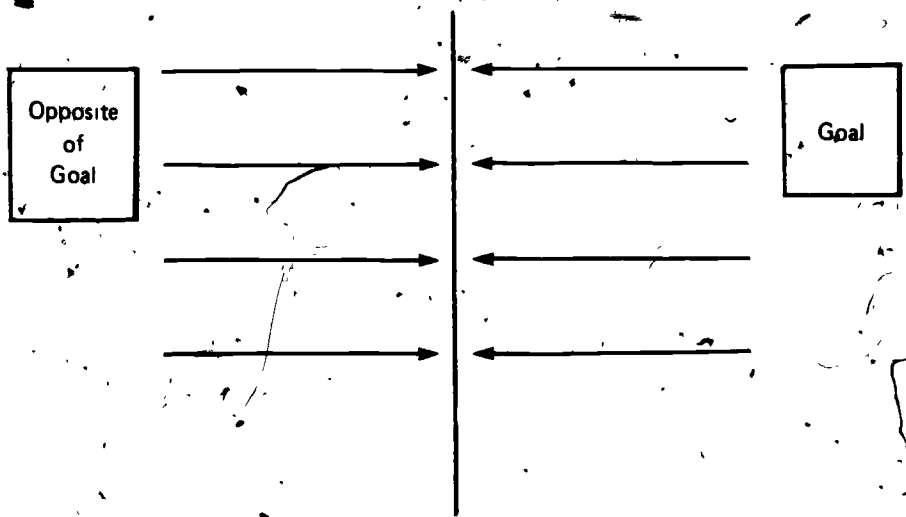

FIGURE 2

Source: Gaskell.

situation, the teacher draws a diagram and lists the forces pressing for open criticism and those pushing against it (see figure 3). The forces on the left, if allowed to become dominant, would push toward the goal of open and active criticism between students and instructor. The forces on the right are those that inhibit the attaining of the goal and could result in the complete absence of criticism. Gaskell reminds us that "diagnosis is a continuous part of problem solving" and that the force-field scheme may need to be redone several times to identify the basic forces.

With the "identification of forces" we have completed the first of what Sanders sees as the four steps in any kind of "decision making, problem solving, change, or program planning." The second step involves choosing an entry point or "unfreezing" the current situation (see figure 4). A decision is made to strengthen a driving force or to weaken a restraining force in order to move the program in the desired direction. Sanders disagrees with many of the authorities in change strategy who "suggest that a strong unsettling experience is necessary to destroy the equilibrium of the status quo." Sanders believes it is preferable to weaken a restraining force, thereby avoiding severe reaction and disruption.

Step three involves "moving to the new level." This movement is the result of a planned combination of strengthening and weakening forces. When the program reaches its new level, it undergoes "refreezing," the fourth step, which requires "planned and organized evaluation and monitoring of the new process." This monitoring assures that inertia will not drag the program back to its old level.

Gaskell recommends that the compilers of the field analysis rate the driving forces on a simple numerical scale in terms of their importance and their ease or difficulty of change. Such a ranking system might be of help when making a decision about the entry point.

Force-field's great advantage is its simplicity. The technique can be learned in a single sitting. Yet, as simple as the procedure is, it nonetheless provides an alternative to other "oversimplified systems which see only a single cause and

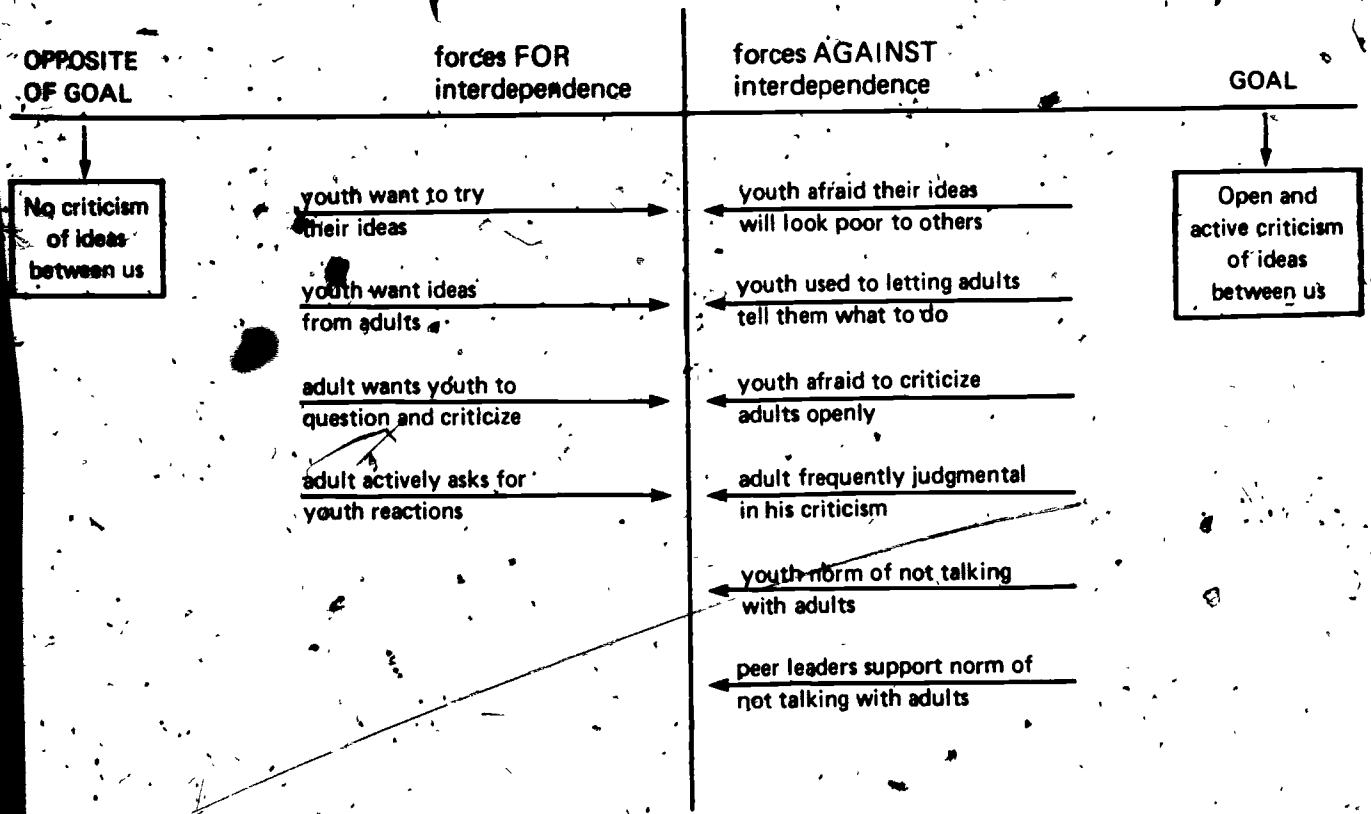

FIGURE 3

Source: Gaslell

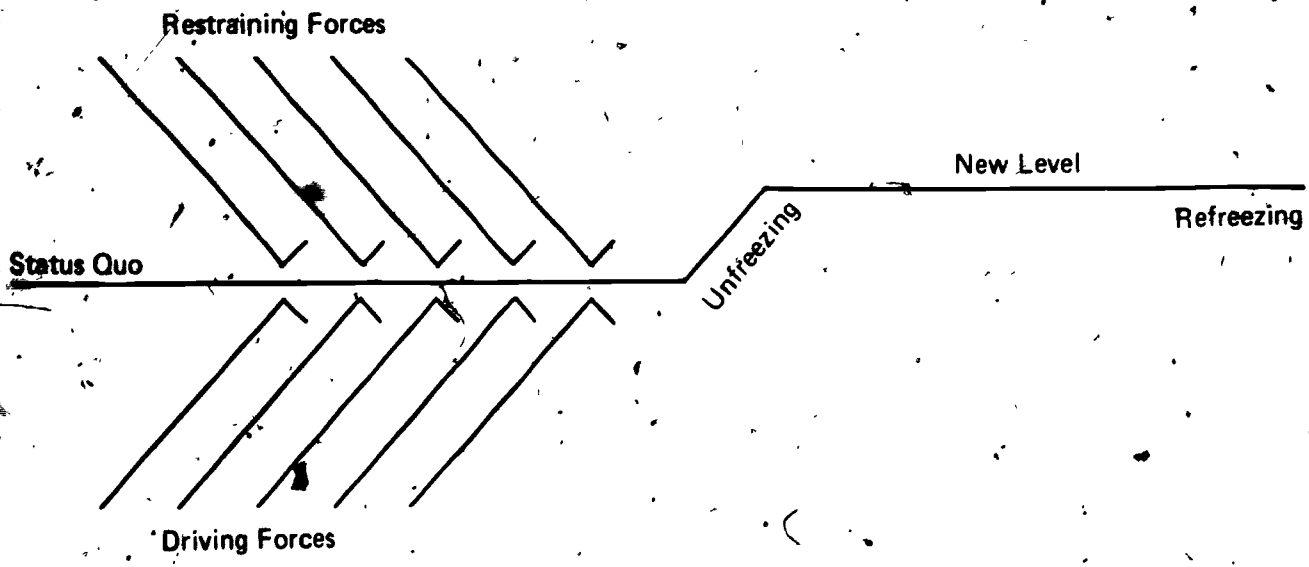

FIGURE 4

Source Sanders

effect." Sanders also points out that it can be used in conjunction with statistics to "any degree of sophistication which may be considered desirable."

Force-field analysis seems particularly useful for current programs that are faltering. Programs for minority students, government-mandated programs, community service programs, vocational programs, and plans for curriculum evaluation and change seem ideally suited to this kind of approach. Unfortunately, making the force-field work is not as easy as Sanders makes it sound. The model offers no practical advice on choosing a point of entry, which is, after all, at the heart of decision-making. It presents little or no advice or help for starting new programs. And it proposes no readily useful means for reaching consensus on the direction of desired action.

FINDING SOLUTIONS: THE NOMINAL GROUP TECHNIQUE

Where do solutions to problems come from? Unfortunately force-field analysis does not answer that question. It prescribes no theory or practice for gathering input on possible solutions to a problem. What administrators need, besides an easy method for analyzing problems, is a technique for generating alternative solutions to them.

An Alternative to Interacting Groups

Recent trends in educational management stress the importance of involving management personnel in the decision-making process. The management team, which operates on the theory that persons who are affected by decisions should help make them, is only one innovation making use of this theory. The nominal group technique is another.

The nominal group is the antithesis of the traditional interacting group or ideas session—sometimes known as "brainstorming"—which is often cited as a model of democratic procedure. Brainstorming is characterized by an open exchange among group members in which everyone is encouraged to participate freely. But Van de Ven and Delbecq contend that interacting groups often get stuck on a single topic and merely elaborate on it. Interacting groups reach for decisions before problems are fully aired and are more geared to problem disposal than problem understanding. They also have a regrettable tendency to reinforce certain human weaknesses: people are more comfortable responding to ideas already proposed than they are coming up with new ideas. Verbally proficient members dominate the interacting group. Divergent opinions are often ignored.

To combat these weaknesses, Delbecq and Van de Ven have created a group in which "individuals work in the presence of each other but do not interact."

> Instead, each individual is writing ideas on a pad of paper in front of him. At the end of 10 to 20 minutes, a very structured sharing of ideas takes place. Each individual in round-robin fashion provides one idea from his private list which is written on a flip-chart by a recorder in full view of other members. There is still no discussion, only the recording of privately generated ideas. This round-robin listing continues until each member indicates that he has no further ideas to share. The output of this nominal process is the total set created by this structured process.

Only after all aspects of the problem are explored does the process of ranking the ideas in order of their importance begin.

How effective is the nominal group? Van de Ven and Delbecq cite studies showing that in terms of the "mean number of ideas," "the mean total number of ideas produced," and the "quality of ideas produced," the nominal groups were found to be "significantly superior to brainstorming in generating information relevant to a problem."

There are many reasons for this superiority. Because it avoids dominance by one individual, the procedure encourages the expression of divergent and incompatible ideas. It "stimulates creative tension by means of the presence of others, the silence, and the evidence of activity." It induces a sense of responsibility in all the members and encourages the expression of minority ideas. Such an organization of activity causes the group to "perceive the task with an attitude of 'problem-mindedness' as opposed to 'solution-mindedness'."

The nominal group can be used not only to identify problems but to provide solutions as well. In the first round, members are asked to concentrate only on identifying the problems at hand. Once the major problems are cited, members are asked to concentrate on solutions. Van de Ven and Delbecq suggest that the two different aspects might be approached either in different sessions or by different groups.

The Nominal Group as an Intervention Technique

Mosley and Green report success in applying nominal group procedures in all areas of problem diagnosis, planning, and evaluation and in situations as diverse as business organiza-

tions, churches, and a university. The members of the organization constitute the membership of the nominal group. Employees work together to identify the organization's problems and to suggest solutions.

For interventions of this sort, Mosley and Green recommend a different problem-identification procedure. They suggest that the participants list the organization's strengths before they list problems: "Changing this one-sided, negative focus into a two-dimensional perspective which includes organizational strengths often has a dramatic, positive effect on the general receptiveness of the entire OD (organizational development) effort, most of which still lies in the future." They also recommend that when intervention in a hierarchical structure becomes necessary, persons of similar rank should be grouped together to prevent a potential influencing of subordinates.

Another, quite different, application of the nominal group is cited by Zastrow. He used the technique to poll a university social work class to discover student preferences for course content. By means of the technique, Zastrow reports that he was able to understand the students' interests and was better able to serve those interests.

Planning New Programs

Because of its ability to generate problem descriptions from a client population, the nominal group technique is especially suited to the early stages of program planning. It is especially useful in cases where a "variety of groups, fragmented in terms of vested interests, rhetorical and ideological concepts, and differential expertise, need to be brought together for a program to emerge or for change to take place" (Delbecq and Van de Ven).

This description would seem to apply to community service programs in the public schools or any service program designed for the benefit of clients of the school district. These might include programs designed to reach disadvantaged students (special skills programs for minority or handicapped students), programs to implement busing, vocational guidance,

programs, and counseling and testing programs. Within the district itself, the technique can be used to gather information and ideas about curricular change, policy changes, and program implementation.

Delbecq and Van de Ven have written a Program Planning Model (PPM) that makes use of these nominal group techniques. The first step of PPM is called the problem exploration phase. A target group of participants is identified in terms of their involvement either as potential clients of the new program or as people responsible for implementing it. Which individuals are included in this group depends on the degree to which the program will affect them. Once this group is assembled, members are asked to identify problems this new program must solve.

Delbecq and Van de Ven have discovered that the enumerating of problems often involves a revelation of personal details. For example, a program being set up to help handicapped students will probably require the sharing of considerable personal information by the handicapped members of the nominal group. The authors feel that the nominal technique provides a way for the participants to gradually volunteer these "personal dimensions a little at a time."

The actual machinery for running the group will vary from case to case. In large groups, Vroman recommends that satellite groups of from ten to fifteen members be used. The display of written materials will also depend on the number of participants involved. Some commentators recommend listing all materials on a large board in front of an assembled group. Often a break in the proceedings will be necessary to compile and display the list of problems. Some groups will choose to vote on and display only the most significant problems uncovered. In some cases it may be more advantageous to display *all* ideas to the group.

Knowledge exploration, the second phase of the model, brings together a selected group of clients from phase one and a group of resource experts. This new group is presented with the list of problems resulting from the first meeting. Using nominal group technique again, this group responds to two

questions: "What existing resources can be used to solve these problems?" and "What new resources will have to be created to solve these problems?" Respondents list their answers, which are again collected and displayed round-robin fashion. From these answers, a list of existing resources and a list of new resources will be developed.

The final phases of the program do not utilize nominal group procedures. The actual writing of the program description must be accomplished by technicians who match needs with resources. However, the very last phase of the program involves reporting back to the participants in phase one an explanation of the final content of the program.

Thorough information gathering and analysis are important parts of decision-making. The nominal group technique presents an easy, convenient method of gathering information and ideas on a variety of topics from the clients or constituents of an institution.

ACHIEVING CONSENSUS: THE DELPHI MODEL

A decision is a collective agreement on a single course of action. It represents the best response to a current state of affairs and, presumably, it represents a consensus. A large part of decision-making is actually the attempt to find common ground, to reach a decision all parties can live with. The nominal group technique recognizes the importance of achieving consensus when it includes affected parties in the process of program planning.

Although decisions deal with current situations, all decisions face in two directions. They remedy past problems and attempt to anticipate future ones. Thornton and colleagues predict "it is inevitable that more of the future of education" will be taken into account by educational managers. Increasingly, decision-making in the public schools must look toward the future.

How do we achieve consensus in the decision-making process? And how do we plan for the future? For many program administrators, the answer to both questions is the Delphi model.

History and Assumptions of Delphi

As Dalkey and Helmer report, Delphi was originally conceived by the Rand Corporation as a method of obtaining "the most reliable consensus of opinion of a group of experts." The general procedure for the Delphi forecast is quite simple. A number of experts on the subject under examination are selected. They agree to respond to a series of questionnaires to be mailed to them. On the first questionnaire, the experts answer questions and make predictions about the matter under study. The questionnaires are returned by mail, the results are collated, and a second questionnaire is returned to each participant.

On this second questionnaire, some means of reporting

the group consensus is employed. The individual's score is also reported. Each participant whose answer lies outside the group consensus (usually defined by a modal or median score) is asked to reconsider his or her original prediction. Any respondent who wishes to remain outside the group consensus is asked to justify that position. A third round of questionnaires reports the new consensus and may also include a minority report of the general reasons participants chose to stay outside the consensus. The original Delphi consisted of five rounds.

Rand researchers discovered that this "controlled opinion feedback" was successful in shaping group consensus toward a final answer. It was extremely successful in answering almanac-like questions and producing consensus predictions about future technologies. The first Delphi attempted to gather opinion about the amount of nuclear firepower that would have to be directed at United States industrial targets to reduce munitions output by a certain amount. Since then, Delphis have been used to predict energy demands, growth trends, and the depletion of resources. Not surprisingly, when social scientists saw the success of Delphi they were attracted by both its consensus-producing powers and its future-predicting qualities. They wanted to use it in their own research.

But as Weaver (1971) points out, the kinds of questions Delphi was most successful in answering had objective, "knowable" technological factors to them. The social sciences do not yet include such factors. It cannot be determined, for example, when "alienation and impersonality of urban living will reach its maximum." In fact, says Weaver, we do not even know "what it means to speak of a maximum in this case." Because the data base for the social sciences is so much less developed than it is for the hard sciences, and because of differing interpretations of social indicators, Delphi forecasts have been less successful when dealing with social issues. Weaver (1972) concludes that there are too many variables of a personal and subjective nature to permit accurate predicting of social futures by experts. Delphi, in its pure form, is not appropriate in the social sciences as a prediction device.

Although the Delphi cannot be used to predict the "likelihood" of a certain future, Weaver believes we can use the Delphi to talk in terms of what the future "can be made to be." It can be used to help define and create a consensus about social and institutional goals. When used in this way to project a set of values and goals, Delphi is an important tool in futures planning.

The traditional forecasting Delphi has given way in education to the "normative" Delphi where the goal is to probe values and preferences rather than future events. Weatherman and Swenson analyze two forms of Delphi that have the greatest applicability in school districts: the "strategy probe" and the "preference probe." The strategy probe might be employed by a school district that has mandated a new program and wants to poll opinion on the choice of a strategy to implement it. The first questionnaire might be open-ended and simply ask respondents to suggest alternatives. Subsequent questionnaires would ask respondents to narrow their choices and compare the alternatives in terms of cost, ease of implementation, and so forth. In consecutive rounds, a consensus toward a single strategy will emerge. If the respondents themselves are the persons responsible for implementing the program, the move toward consensus will further guarantee the program's success.

The preference probe (called a "focus" Delphi by Sandow) is used in cases when a school district wants to poll its clients or constituents about its priorities. This probe reveals essential information about the participants themselves and their preferences, which the district takes into account when setting its goals.

Both these probes differ significantly from traditional Delphis in that they do not depend on expert opinion. When comparing two studies, Welty discovered that in the area of values forecasting laymen and experts produced roughly the same results. There is no need, then, especially in the area of values forecasting, for a selected panel.

Five Sample Applications

Delphi has many variations. The following applications exemplify some of the situations to which the method has been applied.

Media Technology Survey

Spitzer reports the use of a traditional Delphi to predict "trends in the future of educational media and technology which . . . might be the most significant in the period culminating in the year 2000." Two hundred potential respondents, chosen from a professional directory, were contacted and asked to "nominate" what they thought were important trends. Half of this group responded to the open-ended questionnaire, and sixty-eight trends were recorded.

These trends were listed in the second questionnaire and returned to the respondents, who were asked to rank them on a one-to-five scale in terms of their "importance," "their predicted increase," and the "certainty of prediction." (The last category, "certainty of prediction," was an attempt to have each person rank his or her expertise in the field; it was deleted after the second round.) In subsequent rounds respondents received information about the consensus of the group and were asked to reconsider their answers. In all, four rounds were conducted.

Spitzer acknowledges that the results of the survey are difficult to interpret because they contain a "number of ambiguities and methodological problems which need further investigation." Some of the methodological difficulties concerned the reporting of the data. Spitzer's data include four pieces of information for each trend in the second, third, and fourth rounds. However, the data for the third and fourth rounds are not readily comparable to that for the first and second rounds because of the deleted item. The data are arranged primarily to demonstrate the consensus convergence phenomenon and therefore in the manner least advantageous to rating the trends themselves. Because a Delphi consists of statistical information, results must be displayed in a clear,

straightforward format.

There is a philosophical problem with the survey as well. It seems to be the uneasy combination of preference probing and expert opinion that Weaver warns against. When respondents were asked to estimate the "importance" of a trend, did they understand that to mean its importance or value to them? Or did they understand it to mean the impact of the trend on education? Unless this distinction is made clear, the Delphi will be measuring two completely different phenomena.

Although the survey was unable to make any final ranking of the importance of certain media trends, it does clearly demonstrate the process of producing consensus.

School of Education, University of Virginia

Before beginning their Delphi preference probe, Cyphert and Gant hypothesized that perhaps one "reason why schools of education have not recieved the support they desire on either a moral or a fiscal level is that they have not accurately assessed the judgments made about them by others." So they decided to use a Delphi probe to gather public opinions about goals for the School of Education at the University of Virginia.

Researchers selected 400 initial respondents from several categories: students and members of the School of Education, statewide educators, members of parent-teacher organizations, members of the state board of education, newspaper editors, politicians, and persons from civic groups with educational interests.

Questionnaire I asked these people to "suggest prime targets on which the School of Education should concentrate its energies and resources in the next decade." Questionnaire II presented sixty-one generic items with a five-point grid for rating the priority of each item. Questionnaire III reported both the group consensus and the individual's response for each item. Respondents were asked to rate the items again. "For all items where the participant wished to remain outside the consensus, he was asked to state his primary reasons for so doing."

Questionnaire IV contained the modal score for each item, the respondent's prior rating, and a summary of the major dissenting opinions for each item. Respondents were asked to consider the opinions and make a final rating. The results of the final questionnaire yielded not only a list of the important targets but also the amount of public agreement on each one. From the probe the School of Education at least learned what the public feels its goals ought to be.

Cyphert and Gant report that "virtually all (99%) of the respondents' changes in opinion occurred on Questionnaire III, which informed them of the first 'consensus' reached by the group." They question the need for more than three rounds of questionnaires.

The Delphos Branch Campus

The faculty of a university was divided on the issue of establishing a branch in another city. Administrators decided to do a Delphi probe to find where the disagreements were and to build consensus for a set of goals. Judd remarks that this survey is unique in that "the experts responding to the questionnaire set were exclusively part of the microcosm under study."

The first round of the questionnaire was a blank sheet of paper on which faculty were asked to list their statements of goals for the new branch. A second questionnaire supplied a list of goal statements, which respondents were asked to rank in order of desirability. The third questionnaire listed each statement, its rank, and the amount of consensus generated in the second round. Faculty members were asked to return this questionnaire only if they strongly disagreed with some rankings.

Since this study presents little or no numerical data, it is not as complex as most Delphis. The wisdom of making round three optional is questionable; it was the only round in which dissent was registered. Treating dissent as an option in which the dissenter must take the initiative to register his or her thoughts may have the effect of discouraging dissent. Under this circumstance, consensus is created partially by default.

To be valid, a survey should require all respondents to reply in any round for their opinions to be considered.

Judd reports that the final rankings were important not only for setting policy goals of the new campus, but also because the questionnaire process was itself an important tool for gaining the support of persons originally opposed to the project.

Ellenstown, Washington, Public Schools

As the public schools reach out into the community to serve its needs, more ways need to be found to poll the community about its attitudes and to acquire its support. Rasp reports a use of Delphi to serve those ends. Similar in some ways to Cyphert and Gant's Delphi at the University of Virginia, this survey in a public school district collected "data from which goals for building better programs could be developed." This four-phase Delphi was mailed to a sample of "local students, staff, parents, citizens, and teacher trainers from the state colleges and universities."

The first questionnaire was fairly open-ended. When recording their opinions, respondents were asked to think in terms of the period from 1975 to 1985:

As a result of the experiences provided by the Ellenstown School District, students should:

Know _____

Be Able to _____

Feel _____

Ellenstown School District should:

Increase _____

Maintain _____

Reduce _____

Develop _____

From these first-round questionnaires, a second questionnaire was developed that contained a list of statements. Respondents were asked to circle numbers on a one-to-seven scale. Here are two sample items:

As a result of the experiences provided by the Ellenstown School District, each student should:

low						high	
1	2	3	4	5	6	7	View competition in all things as healthy.
1	2	3	4	5	6	7	Be able to read and understand a newspaper.

A third-round questionnaire was mailed only to those who responded to the second questionnaire. In the third round, the modal answer (the answer cited most frequently) was indicated by a square. The individual's response was indicated by a circle. Respondents were asked to study each item. If the mode for the item did not represent their thinking at that moment, they were requested to state their reasons in a space following the item. The third questionnaire had this form:

As a result of the experiences provided by the Ellenstown School District, each student should:

low						high	
1	[2]	3	4	(5)	6	7	View competition in all things as healthy.
1	2	3	4	(5)	[6]	7	Be able to read and understand a newspaper.

The fourth round recalculated the consensus from the third round and also included a minority dissenting report for each item. The respondent was asked to consider this information as well as the group consensus and to make a final judgment. Rasp and his colleagues decided, in retrospect, that the fourth round was not necessary.

The results of this survey, concludes Rasp, provided Ellenstown's superintendent and staff with valuable information from citizens about community values and school priorities. Even in the face of certain limitations, "Delphi does have strength and utility. It collects and organizes judgments in a systematic fashion. It gains input. It establishes priorities. It

builds consensus. It organizes dissent. In short, it cannot be overlooked as a useful-and reliable decision-making tool."

Dallas-Fort Worth SWEP Survey

The Skyline Wide Educational Plan (SWEP) instituted by the Dallas and Fort Worth Independent School districts is a much larger, more ambitious attempt to survey community values for the school district than we have thus far encountered. Burns reports that the procedures vary slightly from traditional Delphis in that only two questionnaire rounds were used. Also, the number of participants (over 900 persons invited to respond) was quite large in this case. The attrition rate for the two questionnaires was 75 percent; that is, nearly 700 people either did not respond at all or dropped out after the first round. Considering the attrition rate, the decision to have only two rounds may have been wise.

Unlike the Ellenstown Delphi, the first SWEP questionnaire was not open-ended. It consisted of 105 goal statements in the general categories of "basic skills, citizenship, ethics, aesthetics, careers, health and recreation, and life management." In addition, the questionnaire included twenty-nine "process goals statements." For each item, respondents were asked to answer in two ways. A simple yes-no answer was requested to see if the respondent felt that the item represented a "core" skill that "all students should have before completion of their program of studies." A five-point Likert scale was also used so that the respondent could assign a priority to each item. On the second questionnaire, space was allowed for the expression of minority opinions.

Perhaps an even greater difference between this and earlier surveys is the use of a computer to analyze and display the data. The districts have not only analyzed the answers to find the degree of consensus for each item, but have also analyzed the data in terms of "age, sex, patron, ethnicity, occupation, and residence." The use of the computer certainly makes it possible to manipulate the data in more ways for more purposes. Used this way, a Delphi probe can be an extremely complicated procedure. If there is some upper limit to Delphi

complexity, the SWEP survey probably approaches it. An attrition rate of 75 percent is very high. Because of concern for the reliability of the final sample, it would be interesting to know *who* dropped out and *why* they did.

Other Uses

Sirois cites the use of a Delphi model for measuring performance. This model establishes criteria for "arriving at judgments regarding the remedial needs of local school districts." The Delphi is used to establish consensus about what makes a good program, and it creates a set of criteria against which to measure local performance.

Skutsch and Hall suggest that Delphi can be used in all areas of "facilities, services and curriculum planning." In the area of facilities, Delphi can be used to project enrollment and the use of facilities and to determine where new facilities should be located and how new facilities can be designed for maximum use. Delphi can help find answers to questions of student and community services. Questions concerning electives, required subjects, and vocational and remedial training can, to some extent, all be answered by the Delphi model.

The Escondido Union Elementary School District, California, has used Delphi to resolve a number of diverse management and operational problems. The district has used the technique to reorganize its administrative services, evaluate principals and central office administrators, establish differentiated staffing patterns at various schools, implement a year-round school program, establish a multimedia center in an elementary school and a junior high school, resolve priorities for budget expenditures, determine personnel staffing needs and priorities and identify needs for clerical and custodial services and for equipment and supplies for individual schools.

Some Precautions

Some advantages of Delphi should be obvious from these examples. Skutsch and Hall cite Delphi's applicability in situations where the following factors are present or desired:

1. A variable number of people with varied skills and status are to be included.
2. Democracy, in which each person contributes to the best of his ability, and has an equal vote, is the standard.
3. No prior training or "team-building" is feasible to develop good working relationships.
4. A variable number of questions or issues are to be posed.

As successful as Delphi may be in these kinds of situations, some precautions for the would-be designer of a probe are offered by almost every writer on the subject. Early in the design stage, a decision must be made about a method of reporting results. Although some Delphis supply verbal rather than numerical data (see Strauss and Zeigler, for example), most rely on a mathematical measure of consensus.

Of the mathematical probes mentioned above, the SWEP survey and the Media survey report their results in terms of the mean (the average of all responses). The University of Virginia and the Ellenstown schools' Delphis both report their results in terms of the mode (the response most frequently chosen). Of all the studies mentioned here, only Cyphert and Gant give any space to reasons for choosing one technique over another. They reject the mean because "few of the response scales used in a Delphi instrument assume equal intervals." The mode is generally favored "in efforts to gain opinions about desired future conditions," while the median (the number midway between two extremes) is "often used in surveys focusing on judgments about time or quantity."

Another factor in a Delphi survey is time. Questionnaire results must be read and analyzed, and the new questionnaire compiled and mailed out quickly. Long delays between rounds must be minimized if respondents are to be kept interested. Skutsch and Hall estimate that three rounds of a mail-out Delphi with thirty respondents would require about 142 hours of work and two months for completion of the project. More complex projects would require correspondingly more time.

A more significant problem concerns the need for objectivity in composing the questionnaire materials. Rasp notes that "almost every study on the Delphi has testified to an uneasiness regarding the development of the second question-

naire." Folk and other writers point out that the translation of raw verbal data into a goal statement or any kind of supposedly objective item is a difficult task. Weaver (1972) warns that the content is subject to the biases of the compilers. Even the choice of "alternative response forms is subjective."

The Consensus Phenomenon

The greatest philosophical controversy over Delphi has to do with the consensus phenomenon itself. What causes it? Weaver (1971) says the Delphi process assumes that the experts or respondents will make logical; reasoned conclusions. But, he maintains, people may in fact change toward consensus for social or psychological reasons.

Cyphert and Gant's study even provides some evidence that the Delphi can be used to manipulate participant response. They inserted a bogus item in their questionnaire results and reported that it had achieved a high degree of consensus. Subsequent responses showed that participants tended to rate it higher when informed that its consensus was high. Weatherman and Swenson, along with many others, warn that this convergence phenomenon needs to be studied more closely. Paradoxically perhaps, the Delphi cannot give reasons why people prefer one idea over another. It only explains, in the minority report, why consensus does *not* occur.

Some critics warn that the Delphi is a conservative, establishment-oriented instrument. Weatherman and Swenson point out that

> divergent thinkers, who may be under-represented on a Delphi panel, may prove to be the best forecasters. Such persons might find it especially difficult to acquiesce or be committed to a consensus and fail to participate at all. This difficulty may be reflected in item content as well; if experts representing the main currents of thought in a discipline develop items on the initial questionnaire, the error may be compounded.

One might question the logic, for example, of the SWEP survey's selecting group members from "the ranks of reputed 'forward thinkers' in education, business and industry and government." Members were chosen who were considered

"by their own to be several cuts above the ordinary." While SWEP designers maintained that random selection was impossible, it is safe to say that such a group will produce predictable results. Perhaps this is the greatest single charge leveled against the Delphi: by inhibiting exploratory thinking, it merely reaffirms an establishment point of view.

As the future forecasting tool it was designed to be, the Delphi is not given high marks. However, as a tool to gather information about values and ways the future can be shaped, Delphi can be extremely valuable. Folk offers some final advice for those who are considering their own Delphi. First, you will learn more about the procedure by doing it yourself. Second, acquaint yourself with alternative versions, especially those that deemphasize future forecasting. There is no reason, for example, why Delphi must be restricted to a mailing format. Third, acquaint yourself with the literature so there will be no disappointment about the outcome.

CONCLUSION

The school district is a people-oriented enterprise. For this reason it is important that our hypothetical Mr. Smith, and others like him, regardless of their technological literacy, be involved in solving the district's problems and making its policies. If modern management theory has anything at all to say to school districts, it is that all employees have valuable contributions to make, and they are happier in jobs where their opinions are solicited and respected. The models included here have been selected because they offer a nontechnological alternative to problem-solving and because they solicit and respect the opinions of involved workers and clients.

But a model, by its nature, provides only a general outline or working definition. When it comes into contact with a real situation, it can, and should, be changed in many ways. What we hope to have provided here are only broad outlines that are not intended to be inclusive or exhaustive of materials on these models. Hopefully they provide a simple place to begin.

BIBLIOGRAPHY

Many of the items in this bibliography are indexed in ERIC's monthly catalogs *Resources in Education (RIE)* and *Current Index to Journals in Education (CIJE)*. Reports in *RIE* are indicated by an "ED" number; journal articles in *CIJE* are indicated by an "EJ" number.

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Burns, Robert J. *Skyline Wide Educational Plan (SWEP) Product Evaluation Report: Educational Goals for the Future (1980's). SWEP Evaluation Report No. 2.* Dallas: Department of Research and Evaluation, Dallas Independent School District, 1974. 120 pages. ED 109 760 MF $0.83 HC $6.01.

Cyphert, Frederick R., and Gant, Walter L. "The Delphi Technique: A Case Study." *Phi Delta Kappan*, 52, 5 (January 1971), pp. 272-73. EJ 031 660. Contact Phi Delta Kappa, Inc., Eighth St. and Union Ave., Bloomington, IN 47401. Complete issue, $1.25.

Dalkey, Norman, and Helmer, Olaf. "An Experimental Application of the Delphi Method to the Use of Experts." *Management Science*, 9, 3 (April 1963), pp. 458-67. Contact Institute of Management Sciences, 146 Westminster St., Providence, RI 02903. Complete issue, $3.50.

Delbecq, Andre L., and Van de Ven, Andrew H. "A Group Process Model for Problem Identification and Program Planning." *Journal of Applied Behavioral Science*, 7, 4 (Summer 1971), pp. 466-92. EJ 048 000. Contact National Training Lab Institute for Applied Behavioral Science, 1201 Sixteenth St., N.W., Washington, DC 20036. Complete issue, $3.00.

Folk, Michael. "A Critique of Some Futures Prediction Techniques and Their Implications for Educational Planners." *Educational Planning*, 2, 3 (January 1976), pp. 35-52. EJ 144 690. Contact International Society of Educational Planners, Dr. Bernard Kaplan, Educational Policy Research Center, Merrill Lane, Syracuse, NY 13210. Complete issue, $5.00.

Gaskell, William G. *The Development of a Leadership Training Process for Principals. Final Report.* Ellensburg, Washington: Central Washington State College, 1973. 59 pages. ED 074 615 MF $0.83 HC $3.50.

Judd, Robert C. "Delphi Applications for Decision Making." *Planning and Changing*, 2, 3 (October 1971), pp. 151-56. EJ 048 153. Contact Department of Educational Administration, Illinois State University, Normal, IL 61761. Complete issue, $3.00.

Mosley, Donald C., and Green, Thad B. "Nominal Grouping As an Organization Development Intervention Technique." *Training and Development Journal*, 28, 3 (March 1974), pp. 30-36. Contact American Society for Training and Development, P.O. Box 5307, Madison, WI 53705.

Rasp, Alfred, Jr. "Delphi: A Decision-Maker's Dream." *Nation's Schools*, 92, 1 (July 1973), pp. 29-32. EJ 079 292. No longer published.

Sanders, Stanley G. "Force-Field Analysis: A Functional Management System." *Planning and Changing*, 7, 4 (Winter 1977), pp. 143-47. EJ 157 006. Contact Department of Educational Administration, Illinois State University, Normal, IL 61761. Complete issue, $3.00.

Sandow, Stuart A. *Educational Policy Formulation/Planning with the Focus Delphi and the Cross-Purpose Matrix. A Research Report.* Syracuse, New York: Educational Policy Research Center, Syracuse University Research Corporation, 1972. 65 pages. ED 061 634 MF $0.83 HC $3.50.

Sirois, Herman A., and Iwanick, Edward F. "Delphi-Discrepancy Evaluation: A Model for the Quality Control of Federal, State, and Locally Mandated Programs. Paper presented at the annual meeting of the American Educational Research Association, New York, April 1977. 25 pages. ED 137 321 MF $0.83 HC $1.67.

Skutsch, Margaret, and Hall, Diana. *Delphi: Potential Uses in Educational Planning. Project Simu-School: Chicago Component.* Chi-

cago: Department of Facilities Planning, Chicago Board of Education, 1973. 30 pages. ED 084 659 MF $0.83 HC $2.06.

Spitzer, Dean R. "Educational Media and the Delphi: Looking toward the Future." *Audiovisual Instruction*, 20, 10 (December 1975), pp. 5-9. EJ 129 717. Order reprints from UMI, $6.00, additional copies of same article $1.00 each.

Strauss, Harlan J., and Zeigler, L. Harmon. "The Delphi Technique and Its Uses in Social Science Research." *Journal of Creative Behavior*, 9, 4 (4th Quarter 1975), pp. 253-59. EJ 144 049. Contact Creative Education Foundation, Inc., State University College at Buffalo, Chase Hall, 1300 Elmwood Ave., Buffalo, NY 14222. Complete issue, $3.00.

Thornton, Gayle Davis, and others. "Decision Making with Delphi Techniques, Bayesian Procedures, and Monte Carlo Simulations." *Planning and Changing*, 6, 1 (Spring 1975), pp. 49-59. EJ 125 779. Contact Department of Educational Administration, Illinois State University, Normal, IL 61761. Complete issue, $3.00.

Van de Ven, Andrew H., and Delbecq, Andre L. "Nominal versus Interacting Group Processes for Committee Decision-Making Effectiveness." *Academy of Management Journal*, 14, 2 (June 1971), pp. 203-12. Contact Dr. Dennis F. Ray, P.O. Drawer K2, Mississippi State University, Mississippi State, MS 39762.

Vroman, H. William. "An Application of the Nominal Group Technique in Educational Systems Analysis." *Educational Technology*, 15, 6 (June 1975), pp. 51-53. EJ 139 679. Contact Educational Technology, 140 Sylvan Ave., Englewood Cliffs, NJ 07632. Complete issue, $4.00.

Weatherman, Richard, and Swenson, Karen. "Delphi Technique." Chapter 5 in *Futurism in Education: Methodologies*, edited by Stephen P. Hencley and James R. Yates, pp. 97-114. Berkeley, California: McCutchan Publishing Corporation, 1974. Entire document 510 pages. ED 113 795. Not available from EDRS. Order from McCutchan Publishing Corporation, 2526 Grove Street, Berkeley, CA 94704. $15.20 plus $0.75 handling.

Weaver, W. Timothy. "The Delphi Forecasting Method." *Phi Delta Kappan*, 52, 5 (January 1971), pp. 267-72. EJ 031 659. Contact Phi Delta Kappa, Inc., Eighth St. and Union Ave., Bloomington, IN 47401. Complete issue, $1.25.

Weaver, W. Timothy. *Delphi, A Critical Review. A Research Report.* Syracuse, New York: Educational Policy Research Center, Syracuse University Research Corporation, 1972. 67 pages. ED 061 636 MF $0.83 HC $3.50.

Welty, Gordon, "Some Problems of Selecting Delphi Experts for Edu-

cational Planning and Forecasting Exercises." *California Journal of Educational Research*, 24, 3 (May 1973), pp. 129-34. Contact *California Journal of Educational Research*, 1705 Murchison Dr., Burlingame, CA 94010. Complete issue, $2.25, check payable to California Teachers Association.

Zastrow, Charles, and Navarre, Ralphe. "The Nominal Group: A New Tool for Making Social Work Education Relevant." *Journal of Education for Social Work*, 13, 1 (Winter 1977), pp. 112-18. EJ 155 404. Order reprints from UMI. $4.00, additional copies of same article $1.00 each.